

# THE NATURAL COURSE OF GONARTHROSIS

by  
S.A. Jerker Hernborg

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S. A. Jerker Hernborg  
Med.lic., Gbg

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Fakultetsopponent

Sven E. Larsson

Handledare

Bo E. Nilsson



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From the Department of Orthopedic Surgery (Head: Anders G. Hulth) Malmö  
General Hospital (University of Lund)

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This thesis reviews the following papers:

Hernborg, J.S. : ELIMINATION OF Na<sup>131</sup>I FROM KNEE-JOINTS WITH  
DEGENERATIVE CHANGES. Arthr. and Rheum. 11:618, 1968.

Danielsson, L. and Hernborg, J.S. : CLINICAL AND ROENTGENOLOGIC STUDY  
OF KNEE-JOINTS WITH OSTEOPHYTES. Clin. Orthop. 69:302, 1970.

Hernborg, J.S. and Nilsson, B.E. : THE RELATIONSHIP BETWEEN OSTEO-  
PHYTES IN THE KNEE-JOINT, OSTEOARTHRITIS AND AGING.  
Acta orthop.scand. 44:69, 1973.

Hernborg, J.S. and Nilsson, B.E. : AGE AND SEX INCIDENCE OF OSTEOPHYTES  
IN THE KNEE-JOINT. Acta orthop.scand. 44:66, 1973.

Danielsson, L. and Hernborg, J.S. : MORBIDITY AND MORTALITY OF OSTEO-  
ARTHRITIS OF THE KNEE (GONARTHROSIS) IN MALMÖ, SWEDEN.  
Clin. Orthop. 69:224, 1970.

Hernborg, J.S. and Nilsson, B.E. : THE NATURAL COURSE OF UNTREATED  
OSTEOARTHRITIS OF THE KNEE. Clin. Orthop. 123:130, 1977.

Hernborg, J.S., Lindén, B. and Nilsson, B.E. : CHONDROCALCINOSIS: A  
SECONDARY FINDING IN OSTEOARTHRITIS OF THE KNEE. Geriatrics  
32:123, 1977.





## INTRODUCTION

The purpose of this thesis was to summarize a series of studies bearing on the natural course of gonarthrosis (osteoarthritis in the knee). In the past such studies would have been virtually impossible, since the limits of this clinical entity were unclear. Existing histo-pathological, roentgenological and clinical concepts of arthrosis were not possible to apply to systematic clinical studies. However, on the basis of its roentgenographic appearance, Ahlbäck (1968) defined gonarthrosis in such clear terms that this group of patients can now be analyzed with greater confidence. Ahlbäck based his diagnosis of gonarthrosis on the narrowing of the joint space, preferably measured on weight-bearing films, on juxta-articular bone changes - particularly sclerosis - and on articular subluxation. For the selection of cases of the studies presented here, roentgen films, with provocation of the deformity and compression of the joint space such as weight-bearing films, were not available. However, in other respects, the definitions of Ahlbäck were applied. Also, attempts were made to secure so far as possible that cases of secondary arthrosis were excluded. Nevertheless, gonarthrosis, secondary to osteonecrosis (Ahlbäck et al. 1968), may be included among cases classified as primary gonarthrosis. Also, cases of gonarthrosis secondary to osteochondritis dissecans (Lindén 1977) may be included. The cases were collected from a period (1950 - 1958) when, in the city of Malmö, the approach to gonarthrosis was by and large conservative. Operations were few and far between, the selection process apparently erratic and surgical intervention does not appear to have jeopardized our conclusions about the natural course of the disease. Nowadays, this has changed entirely, early surgical intervention such as osteotomy and, later in the course of the disease, replacement arthroplasty having made further studies on the natural course of gonarthrosis impossible.

Synovitis and joint effusion, usually early comers in the course of gonarthrosis were, in our department, treated in some instances with synovectomy, on the assumption that synovitis was the cause of pain in these cases. Today, this type of surgery is not undertaken but there is still some disagreement as to whether

prosthetic replacement of the knee-joint should be combined with synovectomy or not. The first study included in this thesis is concerned with the relationship between degenerative joint changes, pain and synovitis.

In order to study the natural course of gonarthrosis, cases from 1950 - 1958 were selected and re-investigated clinically and roentgenologically 10 - 18 years later. In the selection process it became apparent that the diagnosis had been based in many instances on the finding of juxta-articular osteophytes. This subset of the cases was studied separately. Further data on osteophytes were collected in order to study the incidence of this phenomenon.

Also, an attempt was made to study the incidence of gonarthrosis, at least the minimum incidence representing those patients who sought medical advice, all in an effort to estimate the magnitude of this problem.

The natural course of gonarthrosis during a 10 - 18 year period was studied clinically and roentgenologically in order to clarify how patients, left without treatment, are faring later in life. One roentgenological phenomenon was not included in the study. Bjelle and Sundén (1974) described the relationship between degenerative joint changes and pyrophosphate synovitis. The films were, therefore, surveyed again, this time with regard to radiopaque deposits - chondrocalcinosis.

## SUMMARY OF PAPERS





## ELIMINATION OF Na<sup>131</sup>I FROM KNEE-JOINTS WITH DEGENERATIVE CHANGES

The purpose of this study was to estimate the synovial activity in knee-joints with degenerative changes with special reference to its relationship to pain.

### MATERIAL AND METHODS

Included in the study were 16 patients with degenerative joint changes, mostly roentgenological juxta-articular structural changes indicating gonarthrosis but in some instances joints with osteophytes as the only roentgen finding. All patients had one painful and one less painful or even painless knee-joint. In addition, 34 patients were measured who had had a tibia condyle fracture on one side whereas the other knee-joint was unaffected. Of these patients 11 had a painful knee.

Na<sup>131</sup>I was injected intra-articularly. The disappearance of the radionuclide was measured for 16 minutes by external counting over the joint with a scintillation detector. The points of the disappearance curve formed a monoexponential function and the slope of this function was used for comparison between groups of patients.

### RESULTS

In the 16 patients with degenerative joint changes, the painful joint eliminated the injected radionuclide 1.7 times as rapidly as the painless joint. The difference was significant. Also, in those patients with post-fracture changes who had pain in the injured joint, the rate of elimination was increased significantly and to the same extent. However, in those cases who had post-fracture degenerative changes without pain, no difference between the injured and the uninjured joints could be seen.



## DISCUSSION

The disappearance rate of the injected sodium iodine is probably more than anything else related to the vascularity and blood-flow through the synovialis. The findings indicate that synovitis is of importance for the pathogenesis of pain in cases of degenerative knee disease. In some instances, this stage of the knee disease appears to occur very early.

## CLINICAL AND ROENTGENOLOGIC STUDY OF KNEE-JOINTS WITH OSTEO-PHYTES

The purpose of this study was to evaluate the significance of juxta-articular osteophytes as the only finding in a radiogram of a knee-joint.

### MATERIAL AND METHODS

Included in the study were 19 joints with osteophytes on the patella only and 87 joints with osteophytes medially and/or laterally on the femoral and/or tibial condyles. Fourteen to eighteen years after the initial roentgenogram was obtained all the cases were reviewed with clinical evaluation of function, pain, range of motion and roentgenographic signs of osteophytes and gonarthrosis.

### RESULTS

In the 19 joints with osteophytes on the patella only, structural radiological changes and reduced range of motion had developed in one joint only. In those 87 joints which had medial or lateral osteophytes, structural changes had developed in 34. In these cases, the structural changes were also associated with clinical signs and symptoms, whereas in those patients who had not developed structural changes the clinical signs and symptoms were slight.

### DISCUSSION

Patellar osteophytes do not indicate that the patient will later on develop gonarthrosis. Among joints with medial or lateral osteophytes in the knee-joint, however, about 1/3 develops into gonarthrosis with structural radiological signs of the disease.



## THE RELATIONSHIP BETWEEN OSTEOPHYTES IN THE KNEE-JOINT, OSTEO-ARTHRITIS AND AGING

The aim of this investigation was to study the relationship of osteoarthritis and aging to the occurrence and size of osteophytes in the femuro-tibial joint.

### MATERIAL AND METHODS

Included in the study were 52 joints with osteophytes - in these joints structural changes did not develop later on - 34 joints with osteophytes which later on developed structural changes and, finally, 90 joints in which there were structural changes as well as osteophytes on the initial radiograms. Ten to eighteen years later, all the cases were re-examined with roentgen-examination of the knee-joint. The size of the osteophytes was measured both on the initial and the follow-up radiograms.

### RESULTS

The osteophytes in the initial radiograms did not differ significantly between joints which later on developed structural changes of gonarthrosis and joints which did not. However, in joints with established structural changes of gonarthrosis already in the initial radiograms, the osteophytes were larger. The size of the osteophytes was age-related but the relationship was not significant in patients who had already developed structural changes. The growth of osteophytes was less in those patients who did not develop structural changes as compared with patients who did develop structural changes and patients who had structural changes to start with.



## DISCUSSION

The findings indicate that osteophytes in knee-joints are a sign of aging. However, in some instances, which cannot be predicted, joints with osteophytes later develop structural changes, the osteophytes then continuing to grow in size.

## AGE AND SEX INCIDENCE OF OSTEOPHYTES IN THE KNEE-JOINT

The findings in the above-mentioned studies and those of other authors indicate that osteophytes in the knee-joint may be a sign of age and instability rather than of degenerative joint disease. The purpose of the present study was to describe the age- and sex-specific incidence of osteophytes in a population without known knee symptoms.

### MATERIAL AND METHODS

Included in the study were altogether 1179 joints of which radiograms had been obtained for reasons other than knee symptoms. Six hundred and twenty-six joints were studied on phlebographies mainly obtained for the diagnosis of deep vein thrombosis, 308 arteriographies for the diagnosis of arterial occlusion, and 345 joints in films for the purpose of routine search for metastases after operation for carcinoma of the breast. In all the films the presence or absence of definite osteophytes was noted.

### RESULTS

Osteophytes were more common in women than in men; and in women the incidence increased rapidly with age so that of all older women about 1/3 had obvious osteophytes. Regardless of age and sex, osteophytes were more common in arteriographies than in phlebographies.

### DISCUSSION

Osteophytes increase in frequency with age just as they increase in size. They

are much more common in women than in men. In these respects they follow the pattern of gonarthrosis with the difference that osteophytes are about 10 times as common as structural changes indicating gonarthrosis. The discrepancy in the findings in arteriographies and phlebographies may simply reflect an interaction of biological aging, since both osteophytes and obliterating arteriosclerosis of the lower limb are age-related.

## MORBIDITY AND MORTALITY OF OSTEOARTHRITIS OF THE KNEE (GON- ARTHROSIS) IN MALMÖ, SWEDEN

The aim of this study was to evaluate the incidence of gonarthrosis in the city of Malmö. Also, an attempt was made to relate the life expectancy in these patients to that of the population at risk.

### MATERIAL AND METHODS

From the record room of the Radiology Department, the only one in the city of Malmö, all cases with juxta-articular structural changes indicating gonarthrosis were collected for a 9-year period. These data were related to the census data of the city and a minimum incidence was calculated representing those patients who had sought medical advice because of knee symptoms. It was then assumed that a number of cases had remained un-diagnosed since films had not been obtained in weight-bearing. An approximative correction factor based on previous studies was therefore introduced. The expected mortality was calculated for the various age groups on the basis of the mortality rates in Sweden. Cases with radiological signs or clinical records of secondary gonarthrosis were excluded.

### RESULTS

The incidence of gonarthrosis increased until the age of 70 for men, and 80 for women. The incidence was slightly over 1 per cent for men, and slightly below 3 per cent for women in the oldest age-groups. The mortality rate was more than that expected in most age-groups.

## DISCUSSION

These data represent a minimum incidence. The true incidence, which would also include those patients with or without knee symptoms in the city who escaped the diagnosis during this time period, is probably considerably larger. The increased mortality in this group of patients probably reflects again the interaction of biological aging and degenerative joint disease.



## THE NATURAL COURSE OF UNTREATED OSTEOARTHRITIS OF THE KNEE

The purpose of this study was to describe the course of primary gonarthrosis in a series of patients not treated by surgery.

### MATERIAL AND METHODS

Included in the study were altogether 94 joints in 71 patients who had been examined in the past. This initial examination had included a radiogram with definite structural changes diagnostic for gonarthrosis. A follow-up examination was conducted 10 - 18 years after the first examination, including clinical and roentgenological parameters of pain, dysfunction and deformity. Also, the advance of the disease as judged by the patient and the roentgenological progress was estimated.

### RESULTS

More than half of the knees had more severe symptoms at the time of the follow-up than at the time of the initial examination, the course being slightly less favourable in the younger women. Only 11 knees were painless at the time of the follow-up examination. Late onset of symptoms was associated with a better prognosis. Also, pain at rest became more common with time - in fact, it became just as common as in coxarthrosis. The function decreased with time so that the majority of the patients did not walk well enough to be able to use public transportation. In most instances the changes remained limited to the aspect of the joint - medially or laterally - where it was initially observed. Only rarely did both compartments of the femuro-tibial joint become severely affected, and in these cases the clinical course was significantly worse.

## DISCUSSION

Although the sample is limited, it must be concluded that the natural course of gonarthrosis is unfavourable with regard to pain as well as to function. The patients become increasingly worse over the years and the prognosis appears to be worse than in coxarthrosis.

## CHONDROCALCINOSIS: A SECONDARY FINDING IN OSTEOARTHRITIS OF THE KNEE

The purpose of this study was to estimate the frequency of radiopaque deposits - chondrocalcinosis - in the semilunar cartilages and joint cartilages of patients with primary gonarthrosis of the knee.

### MATERIAL AND METHODS

One hundred and twelve knee-joints in 84 patients with primary gonarthrosis were included. Two sets of films were searched for radiopaque deposits in each patient. These films had been obtained in conjunction with the first visit for knee symptoms and 10 - 18 years later in conjunction with a re-examination. At the re-examination the patients were classified with regard to pain, function, stability and roentgenological changes.

### RESULTS

In the initial radiograms, chondrocalcinosis could not be detected in one single joint. At re-examination, 10 - 18 years later, however, 1/4 of the patients had changes of this kind. Those joints which had developed chondrocalcinosis had more frequently weight-bearing pain and worse varus deformity than those that had not.

## DISCUSSION

The findings of this study agree with those of previous investigators in that chondrocalcinosis was a rare phenomenon in the early stage of gonarthrosis. However, with time such changes become increasingly common with the progress of the disease. It is unlikely that this is due to the metabolic entity usually referred to as chondrocalcinosis, a crystal synovitis causing joint effusion and possibly developing into gonarthrosis. The findings in this study probably represent chondrocalcinosis as secondary to gonarthrosis.

## GENERAL DISCUSSION

### Radiological signs of degenerative joint disease

It may be assumed that gonarthrosis is still being under-diagnosed as well as over-diagnosed in the routine examination procedure. As demonstrated by Ahlbäck (1968), a number of cases will escape the radiological diagnosis unless weight-bearing films are being obtained so that the narrowing of the joint space, the first reliable sign of gonarthrosis in a roentgenogram, is revealed. This type of investigation and other types including valgus and varus provocation of the joint (Norman 1973) are still not routine procedure, not even in elderly patients. On the other hand, the finding of osteophytes may at times be erroneously interpreted as gonarthrosis. Osteophytes in the hip-joint were demonstrated by Danielsson (1964) as being of no importance for the diagnosis of coxarthrosis. In the case of gonarthrosis, patients with painful knees and osteophytes, appear to have a higher than average risk of developing clinical and radiological evidence of gonarthrosis at a later date than the average population. However, the presence of osteophytes is not a proof of gonarthrosis, nor can the risk of gonarthrosis be judged from the size of the osteophytes.

### The prognosis of gonarthrosis

Danielsson (1964) demonstrated that from the moment when the patient sought medical attention for coxarthrosis symptoms, the prognosis with regard to pain and dysfunction was favourable in most cases in spite of radiological progress. However, in gonarthrosis cases the prognosis is less favourable. With increasing radiological changes and, particularly, increasing varus deformity, the function is further impaired and the pain increased. The patient's quality of life is subsequently lowered. In many instances the patient is unable to use public transportation. It was proved in this study that the follow-up examination could not be continued during the winter since this added obstacle was sufficient to prevent the patient visiting the hospital. The data on function presented in this study give an



account of the social difficulties these patients are facing and the risk of developing dependence on family members or institutions. Since we know that the prognosis is poor, it is important that we, even if there is today no method of arresting the development of gonarthrosis, try to help the patient to adjust himself to the expected disability with regard to his future working and living conditions. Whereas in the hip-joint the range of motion and the pain decrease with time (Danielsson 1964), the knee-joint in gonarthrosis becomes unstable with increasing pain as a result. Finally, the poor prognosis of this disease makes the development of good methods of surgical treatment even more important than in the case of coxarthrosis.

#### Aging and gonarthrosis

The data of the present study imply that degenerative changes of the knee-joint, both as manifested by osteophytes and by gonarthrosis in its true sense, are age-related. The probable coincidence with arteriosclerosis in the lower limb and the mortality rates in gonarthrosis also imply that the gonarthrosis patient is fragile for his age. This should surely be kept in mind when the future of these patients, including surgical procedures, is being planned.

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University of Lund  
Sweden